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Nick Passmore

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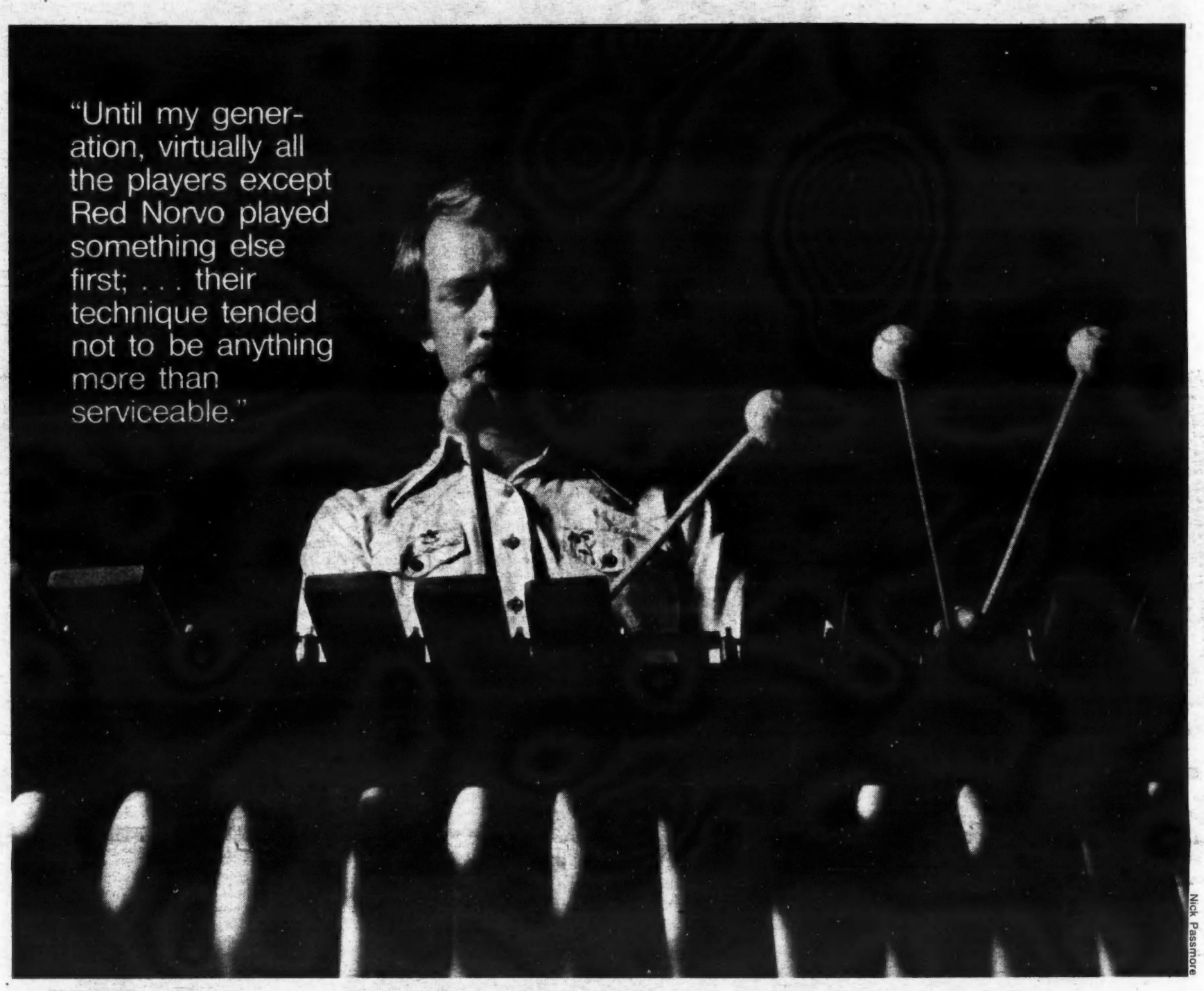
"Until my generation, virtually all the players except Red Norvo played something else first; . . . their technique tended not to be anything more than serviceable."

Nick Passmore

GARY BURTON

The man takes his tremolo seriously

by Bob Blumenthal

*At 33, Gary Burton has already led a musical career that might satisfy two senior citizens. At 17, he was scheduled to appear at the 1960 Newport Jazz Festival (riots ultimately canceled the performance) and debuted on record with Nashville guitarist Hank Garland (*Jazz Winds from a New Direction, *Columbia Special Products). The then-Berklee* School *of Music attracted Burton to Boston, but by 1962 he had an RCA record contract and a road gig with George Shearing. Burton's musical coming of age occurred between 1964-6, while working with the Stan Getz Quartet. It was during this time that* down beat *critics voted him their Talent Deserving Wider Recognition award (1965) and his albums began to reveal a personal direction. (*The Time Machine, *his best album from the period, is currently out of print, as are all of his prior and latter RCA discs.)*

*Things really began happening in 1967, when Burton along with Steve Swallow (bass), and Roy Brooks (drums), left Getz, and joined with guitarist Larry Coryell to form the first jazz group to overtly borrow sonorities and rhythms from contemporary rock. The group was enormously successful with both the rock audience and traditional jazz fans, and Burton was acknowledged as the most popular of the post-Milt Jackson generation of vibes players (*down beat *chose Burton as Jazzman of the Year in '68, and has named him as "best vibist" every year since. He has also topped* db*'s Critics' Poll in the vibes category three times since 1972). Not content to rest on the laurels of such fine quartet albums as* Duster *and* Lofty Fake Anagram, *Burton gave the* avant-garde *important exposure by recording Carla Bley's* A Genuine Tong Funeral *in 1968.*

*In the years between 1969 and 1972 saw a constant shifting of personnel within the quartet over the course of five albums for Atlantic (*Turn of the Century, *a two-record sampling of the Atlantic years, appeared last month). It was at the end of this period that Burton returned to Boston and the now Berklee* College *as an instructor to begin his still-thriving relationship with Manfred Eicher's ECM label. Asked to cite his best albums, Burton quickly lists two ECM duets,* Crystal Silence *(with Chick Corea) and* Hotel Hello *(with Steve Swallow) as well as this summer's* Dreams So Real *"for my own playing." His current quartet, featuring Pat Metheny on guitar, bassist Swallow and new drummer Dan Gottlieb, participated in ECM's recent Festival of Music tour.*

Among his many notable achievements, Burton holds the dubious honor of having been the subject of my first interview as a jazz journalist (in Boston After Dark, *3/12/69). We've all gone through some changes since then — I doubt if Burton would have predicted in '69 that 1976 would find him living in the spacious Chestnut Hill home where our second interview was held. Since this is a Musical Instrument Supplement, we spent most of our time discussing that metallic keyboard Gary plays so brilliantly, but I couldn't avoid some closing questions about Berklee then and now and a few queries about the genesis of his quartet. From here on out, the words belong to Gary:*

Marimba, xylophone, vibraphone and vibraharp all belong to the mallet instrument family. The marimba has very thin wooden keys that have a mellow and low-pitched sound. The xylophone is also a wooden-key instrument, but its bars are thick, so it has a high wood-block type sound. They are about an octave higher than marimba, and have a more shrill tone quality.

The instrument now technically called the vibraharp, which every vibist plays, is the metal-keyed instrument. This was invented in the early '30s, and at first had steel bars; its first name was the vibraphone. A couple of years into its manufacture, hardened aluminum was found to be more practical — it had a better tone quality, was cheaper, lighter weight, all the advantages. At that point they repatented the instrument and had to change the name, so they changed it to vibraharp. Only a dozen or so vibraphones with steel bars were made commercially, though you occasionally hear of one popping up in a collection; but the name vibra*phone* is still more common, and that's the way the instrument's name is translated into foreign languages. I say vibes myself.

The instrument is a natural acoustic machine: the bar vibrates once you hit it, and because it's placed over a reson-

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BURTON

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ating tube, much like blowing over a Coke bottle set at the right pitch, it's amplified and made much louder. There is also a sustain pedal, which functions like the damper pedal on the piano. These are all natural processes.

I don't know why they did it when the invented the instrument, but instead of leaving it like a marimba, with a bar over a resonator, they added this little fan in the resonator pipe that makes the sound go *wow-wow-wow-wow-wow-wow*. At this point almost nobody uses the motor. It's not a vibrato — that would be the pitch going up and down. In this case the volume is getting louder and softer, so it's technically called a tremolo. Like other tremolos, it's not an expressive thing, like a vibrato on a horn. A tremolo is constantly fluttering at the same rate of speed, and all notes are affected the same way. It's more of an effect, but it doesn't add to the expressiveness of the music.

Milt Jackson made the slow vibrato popular. At first, a fast, fluttery vibrato was the thing. In the '40s, when Milt came along, he not only smoothed out the style of melodic phrasing, he also slowed down his vbibrato to half the speed of what had been common. The motor has a rheostat with an adjustable speed, and it can be turned down so it no longer flutters — it just opens and closes slowly. It works well for Milt because it fits his single-line improvising style. He also plays with other instruments that don't tune — he doesn't play with a guitar or woodwind instruments. You get a lot of complaints from certain instruments about the vibrato because they can't stay in tune with it. String players also complain a lot.

I used vibrato when I first started playing because everybody did and it was there; you just plugged it in. But the first regular job I had with a band was with George Shearing, and one of the oddities about George is that he always insisted that his vibes players use no vibrato. It blended better with the block-chord piano style which was his trademark; at the time they called it the "dead vibes" sound. When I was on my own again I tried going back to vibrato and it distracted me. Now I have more control over the phrasing and I can create the illusion that this is a more expressive instrument.

Among young vibes players today, it's about 50/50 on the use of vibrato. Those who are influenced by Milt would still use the slow vibrato, while those more influenced by my style would have no vibrato. That's one of the clear differences between us. Using four mallets with slow vibrato gets congested; once you have more than one line going, you want to separate those parts as clearly as possible.

The vibes don't change intonation unless actual stress changes or faults in the bars occur. Then you retune the instrument by changing the bars. I've had some sets of bars for 10 or 15 years. Extremes of weather don't seem to affect it. Now, with the wooden-keyed instruments, it's different. As a youngster I used to play marimba, and occasionally I would play outdoors at county fairs. A couple of times I noticed that in the hot sun the pitch of the lower bars would go out of tune.

There were once some basic rules of vibes playing — which have all been broken. Like always alternating mallets, left-right, left-right . . . I started out that way, but it was too limiting. As soon as you start playing with four mallets, you have to use what is called multiple-sticking. There are two other things you're always told: don't cross one mallet over another, which I still don't do to this day, and never hit the bar in a certain spot where it doesn't make much sound. There are two of those spots on each bar. Tone quality is basically uniform elsewhere; the variation is so slight that you couldn't hear it in performance.

There are only two major companies which make vibes, Deagen and Musser. At this point, 90 percent or more of the players play Musser. Deagen was the main company starting from the '30s; in the early '50s Musser, who was the general manager of Deagen, left to form his own company. The Deagen family eventually sold out to a conglomerate and became a much smaller company. Musser, in turn, has become much larger and taken the entire school business. The older guys who were Deagen artists in the '40s are still with them — Red Norvo, Milt Jackson, Terry Gibbs — but all the younger players — Bobby Hutcherson, Roy Ayers, myself, Dave Pike, Mike Mainieri — all play Musser. And everybody bought their instruments on their own, rather than the company trying to corral them.

Some people alternate different kinds of mallets, but as a jazz player I'm going for maximum spontaneity. When I'm in the middle of a solo and get an idea, I don't want to take a pass on it because the mallets I'm using are wrong. I have these all-purpose, happy-medium mallets which get the nicest tone and the widest range of dynamics.

There have been some electronic applications for the instrument, some pickups, but my own opinion is that they're not as successful in putting pickups on vibes as they have been with other instruments. At the moment there's quite a loss in phrasing. So vibes have missed out on the current electronic phase, and to some extent that may be why it is not as popular an instrument as others. A lot of people play it — there are more vibraharps sold now than at any time in history. The company can't make them fast enough. Yet you don't see that many vibes players around — you don't see the instrument at the top of the music business. You hear it a lot in the studios, but I guess people are reluctant to haul them around on public performances. For rock it's out of the question; it's been almost solely a jazz instrument . . .

Until my generation, virtually all the players except Red Norvo played something else first; therefore their technique on the instrument tended not to be anything more than serviceable. But Bobby Hutcherson, Roy Ayers, Dave Pike, myself — we all started as mallet players because by our time, the instrument was established.

Red Norvo has never received proper credit; Lionel Hampton popularized the vibes, but Norvo was the first innovator. Red had played xylophone for 10 years before the vibes were even invented; he played vibes with no vibrato in the early years, but since no one had picked up on it even he had gone back to fast vibrato. He was also one of the big innovators in four-mallet playing, and gave it up in the '40s and '50s because Milt Jackson's two-mallet style became so popular.

I started on marimba, which involves essentially the same studying process as vibes. Most vibes players started on other instruments, particularly in the older days. In my case it was purely coincidental. I had shown an interest in music and my family started a campaign to show me different instruments so I could choose. Whenever there was a trumpet on the television, or anything, they would explain what it was. They would also take me to recitals, and one happened to be a marimba recital by a local lady. I was six at the time, so my memory is hazy, but apparently I reacted to the visual aspect of the instrument; I suppose that if I had seen drums I would have picked that. So I started taking lessons from this lady. We moved a year later to a town where there were no teachers, but I had learned to read well enough to adapt piano music.

I grew up in a small town in Indiana and I didn't have anybody else to play with. That's what led to the four-mallet emphasis in my style. It was just too empty when I played a single line. I was adapting most of my music from piano sheet music as well, so that kept me aware of chords. I started with slow pieces only, and over time it became easier and easier. Now the four mallets and my voicings are the most identifiable aspects of my style. Other people play with four mallets, but my lines have more independence — it's more pianistic.

I played marimba in my high school orchestra whenever an occasional mallet part occurred. I also played orchestra bells, triangles, auxiliary percussion odds and ends. There wasn't too much I could do. You see, unlike any other instrument, the entire evolution of the vibes has occurred within jazz music. It's also unique, as far as instruments go, for having no barriers for the beginning musician. All the notes are laid out in front of you in a logical pattern and you just hit them with a mallet. There are no fingering problems, no intonation problems. Even the manipulating of four

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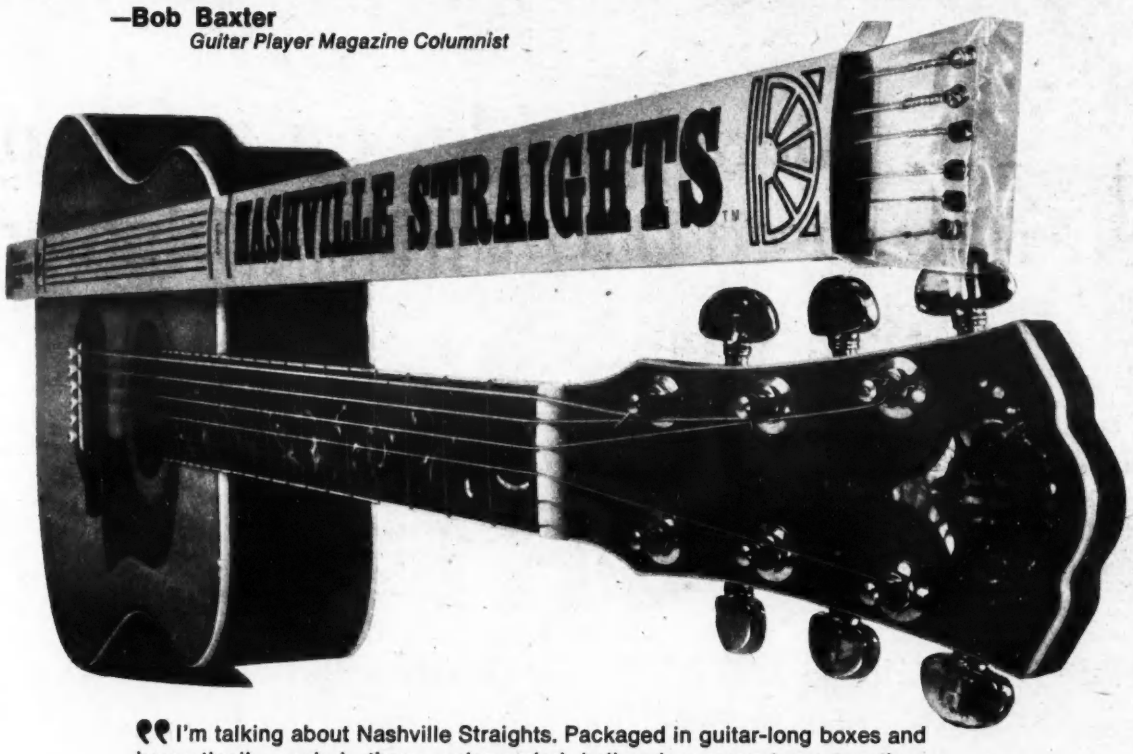
"The most amazing sounding strings are also the strangest."

—Bob Baxter
Guitar Player Magazine Columnist



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BURTON

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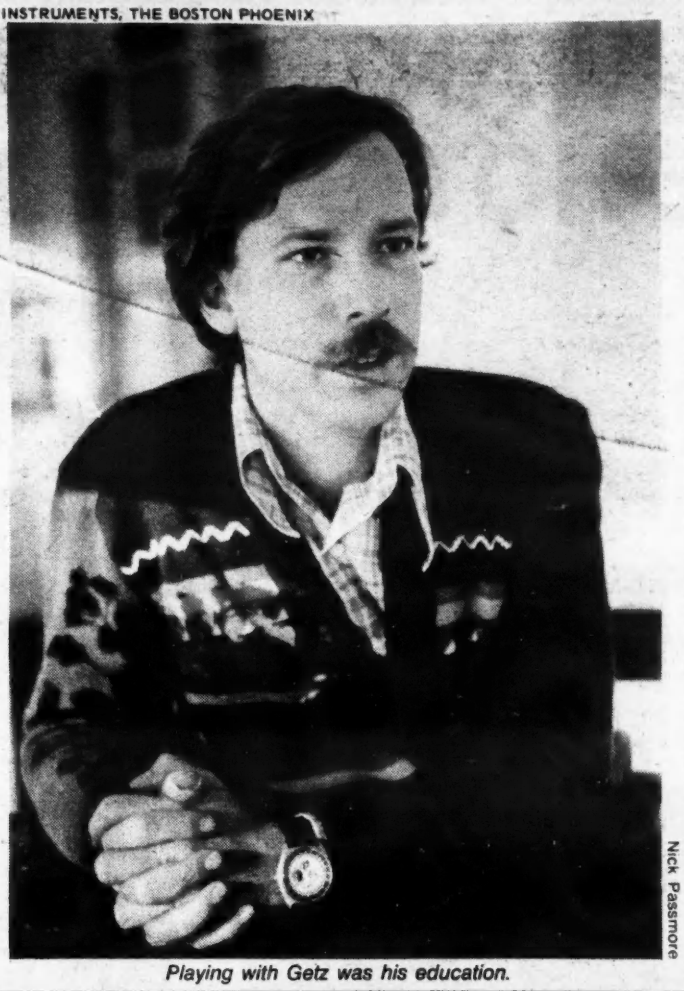
mallets is far less technical than playing the piano with ten fingers.

Now there is more use of vibes in composed music; naturally most of it is in the contemporary, *avant garde* style. I think this is very unwise. I've never understood why traditional composers always use vibes in a shrill way, with very hard mallets pounding away on the thing. It always sounds like a bagful of broken glass being rattled around. Yet jazz players use the instrument as melodically and prettily as possible, with nice, mellow bell-like tones. I see what the composers are doing to my instrument; they write a piece for it and to me make it sound very ugly and harsh. They would never think of doing that exclusively with a violin. Ninety-nine percent of orchestral use of vibes has been with that glassy sound . . . .

It used to be that almost nobody was primarily a vibes player; I mean, we all knew each other, there were so few of us. Now, an ever increasing number decide they want to specialize in vibes. It's been lumped in the percussion category for practical reasons, but unfortunately that goes against all the musical reasons. The practical reason is, the pit band in a theatre hires a drummer and there is a two-bar xylophone part that has to be played on cue. The drummer is supposed to play it because the xylophone is played with sticks. It's not worth hiring a guy who plays only mallets to come in and play that short little passage. But the only thing the drums have in common with vibes is that both use sticks. Vibes also has that in common with hockey and baseball. If drums are 100 miles away from the vibes, piano is an inch.



Nick Passmore

Playing with Getz was his education.

When I was a student at Berklee I didn't have a vibes teacher, because Alan [Dawson] had only started playing them himself that very year. So I switched to being a piano major. I played vibes in some bands, but during the school years I played more jobs on piano than I did on vibes.

At that time there were fewer than 100 students at Berklee, so we all knew each other. The teachers also had very close personal relationships with the students. That model of heavy student-teacher contact has remained; teachers used to work gigs with their students, and they still do. The school is, of course, much bigger now, but in my opinion it hasn't lost the essentials.

When I was a student, the percussion department had only one teacher; now we have 13 or 14, and specialists in everything from tympani to mallets to Latin percussion. At any given time, there are 30 to 40 people specializing in mallets and altogether 100 to 120 taking mallet lessons. You may know some of my former students: Dave Samuels, who taught at the school for a while before going on to New York, and David Friedman, who also lives in New York and performs frequently with Dave Samuels in a mallet duo.

Music has changed drastically since my student days at Berklee, not to mention social spirit. There's a lot of apathy among the students about all sorts of things — about playing, which is the strange thing. When I came to the school, all I did was play. It almost didn't matter what you were playing as long as you did it constantly with other people. Coming from a small town, to suddenly be in four different bands and play in at least one session a day was the greatest thing in life. Now I constantly hear students saying, "I don't want another ensemble, I've got a heavy class load," or "No, man, I can't play lead alto in your Thursday night rehearsal band because I want to watch *Star Trek* and it doesn't end un-

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BUCK DHARMA

Phasing in the Blue Oyster Cult

by Michael Bloom

Blue Oyster Cult has always been synonymous with heavy-metal guitar excellence. Lead singer Eric Bloom coined the term "stun guitar" to describe his own choppy style but the name could well apply to any member of the band. Keyboard player Allen Lanier doubles on guitar, but he's good enough for the lead slot in any lesser band. Even the drummer, Albert Bouchard, plays creditably — one of the band's most spectacular routines involves bringing all five of them to stage front, all playing stinging guitar lines at once.

But the hero of the group is Donald Roeser, better known as Buck Dharma. If I had to pick a native-born rock guitar hero, it would have to be a tossup between Frank Zappa and this little death-dealing Long Islander. Amazingly, Roeser doesn't have to assume monster proportions — he knocks 'em dead on sheer technique alone. He's not completely free of the impulse to make ugly noises, but by and large he picks more cleanly and chooses more fluid lines than, say, Peter Frampton, who is reckoned real good at that sort of thing. (He's certainly one of the "good guys.") For all his talent, Roeser remains obscure and un-

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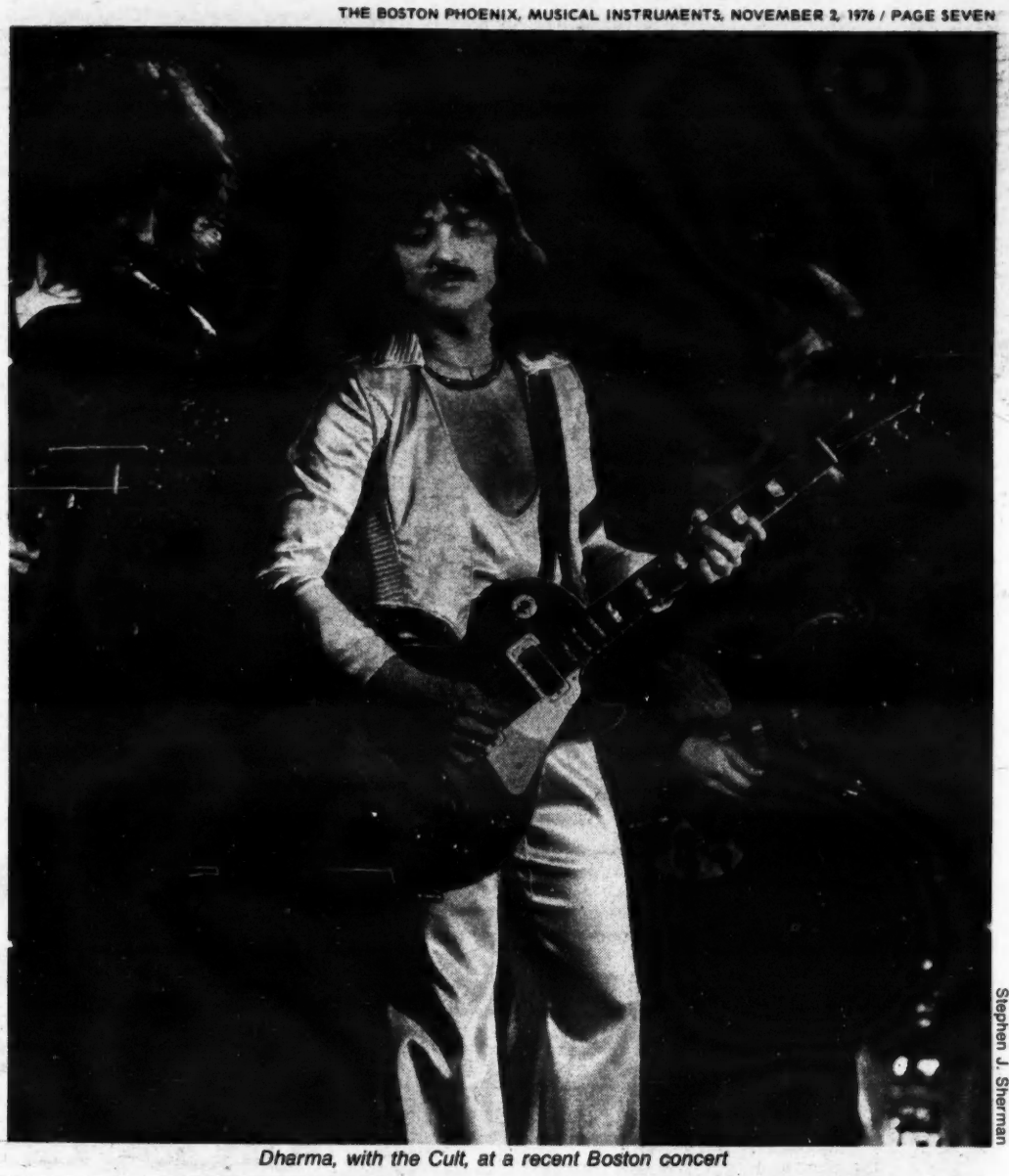

Stephen J. Sherman

Dharma, with the Cult, at a recent Boston concert

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WE REPAIR

DHARMA

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derrated — very few critics and fans greeted the Cult with anything other than sneers until they hit it big with "(Don't Fear) the Reaper."

Roeser is also a crackerjack melodist; if "Reaper" hasn't convinced you, check out "Then Came the First Days of May" from the Cult's first album and too few scattered tunes since. All told, he is unquestionably one of America's most valuable players. And don't take my word for it: at the Music Hall with Boston, the latter band fawned over Buck when he came in.

What with practicing more than four hours a day, Roeser doesn't have much time for non-essentials like interviews. He granted some time while he was warming up for the Music Hall show. Bassist Joe Bouchard also takes part in the interview.

Q: *Would you identify your guitars?*

DR: This white one is a Gibson SG, 1969 — the first good guitar I ever owned. It's been with me for hundreds of thousands of miles. This is a '74 Les Paul — a good guitar, a new one.

This SG here is custom-made. It was made for me by Richard Kresiak, a fan down in Pittsburgh.

Q: *Excellent inlay work. [The third fret was marked with a rendition of the Blue Oyster Cult's mysterious twisted cross. Other fingerboard inlays were more conventional but very well done. — MB.]*

DR: The guy's a good guitar maker.

Q: *Did he start from scratch, or did he use Gibson parts?*

DR: No, just the metal parts are stock parts.

Q: *Do you use any effects?*

DR: I use an echoplex, a fuzztone sometimes and a phase shifter sometimes. I'd like to get a flanger — just haven't gotten around to doing it.

Q: *What'll you do with it if you get one?*

DR: I don't know yet. I would use it where I use the phaser now, because I wish the phaser were more powerful and I think the flanger would cover it. I don't really use it for texture. I just want to get some gross effects with it.

Q: *How long do you practice each day, and what sorts of exercises do you do?*

DR: Before a show I have to warm up — I can't play cold. I have to do two things: get my pick hand working and get my left hand working. So for my left hand I play scales and also these five patterns, these hand positions.

Q: *Are they the standard guitar positions?*

DR: I guess they are. When I figured them out I didn't know they were the standard *anything*, but I've since seen them written up in music books — musicological positioning. With these five positions you can play in any key anywhere on the neck.

Q: *Do you have any special picking exercises?*

DR: Yeah, I double pick, like this [demonstrates] to get my cross picking comfortable, because my hand starts off stiff. Also, I lead with the upstroke when I'm warming up, because up strokes are harder and if I play for half an hour or 40 minutes leading with the upstroke, then it's pretty smooth by the time I'm done and it's easier.

Q: *Where do you balance your picking hand?*

DR: I don't really rest my hand anywhere.

Q: *You float?*

DR: Yeah. Sometimes on the bridge, — you dig in sometimes for some real support — but I don't really have to. Especially in practicing, it's better not to support your hand. That's what I'm shooting for — I'd like to be able just to put my hand down and play.

Q: *Do you do any power chording, and if so, how?*

DR: Yeah, but I don't do much windmilling or anything like that. I think it's mainly because I'm a small guy. If I were bigger it'd probably be easier to do more acrobatic guitar work, but on me the guitar is really big, it's like a bass on some people. If I was six feet tall it'd be easier.

Q: *Have you been watching Tom Scholz, the big guy who plays with Boston?*

DR: Yeah. He's got a real neat thing with the echoplex — a pedal that controls the speed. It's a really nice innovation.

I like a guitarist like Pete Townshend. Townshend's always been underrated as a player.

Q: *He underrates himself. He says, I can't play like . . . and then he names some guitarist who is lame compared to him. And of course, it's not a matter of technique — not solely. Who else do you like?*

DR: I'm a big fan of Al DiMeola's these days. That guy can really play. I think he's the cleanest picker I ever heard, in that kind of flat picking.

I like a lot of guitar players. I like *all* of the guitar playing in Steely Dan. You never hear anything about those guys — Denny Dias, Elliot Randall . . .

Q: *It's the Dan that gets that stuff out of them. Larry Carlton plays that killer solo on "Don't Take Me Alive" — great stuff — and he's the same guy that sleepwalks all over the latest Joni Mitchell album. It's the Dan that does it — they coax these great ideas out of these nor-*

Continued on page 18

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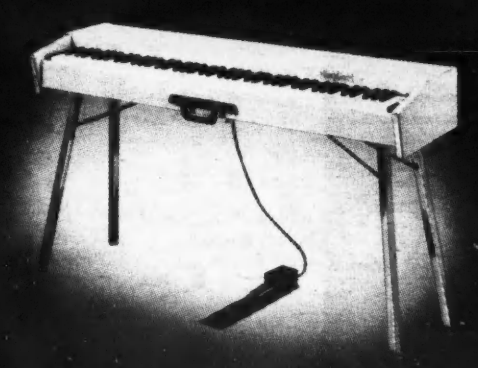
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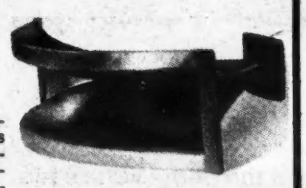

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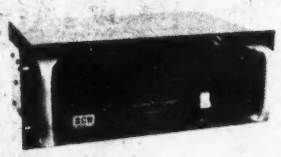

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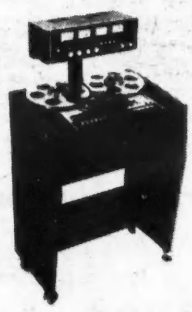

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KEYBOARD CONNECTION

A consumer's guide to synthesizers

by Jim Michmerhuizen

When I was growing up in Michigan I read *Pilgrim's Progress* about four times, along with a lot of science fiction. So when I got involved in electronic music synthesizers it was with all the zeal of a missionary. The particular edition of *PP* that I read had been printed in Philadelphia about 1880 and was illustrated with loads of horrifying engravings. One, near the beginning of the book, showed Christian (the main character) with a despairing look on his face and an enormous and guilty-looking knapsack on his back, a little book in his hand. He was peering into the distance with a hand shading his eyes, shouting "Where can I run to?" or words to that effect.

I was reminded of that look and that cry when someone came to me the other day who had just purchased a rather large synthesizer. His question was not, of course, "Where can I run to?" — but it came, it seemed to me, in pretty much the same tone of voice. His question was more like, "How can I play it?"

An even more heartrending cry is "What shall I buy?" when it comes — as it usually does — from a good keyboard musician who has absolutely no synthesizer experience or, worse still, has had just enough to be confused about whether he knows it or not.

Well, gather round, friends. We're going to lay it all out, exactly the way it is. Well, not *absolutely* all — I'm going to skip some lesser names — but certainly *exactly* the way it is.

Jim Michmerhuizen is the founder and director of the Boston School of Electronic Muisc.

David Krathwohl

A specially designed Oberheim Eight-Voice, and the author's hands

First, however, a few warnings and some spiritual counsel for those on the verge of buying their first synthesizer.

1) No synthesizer is necessarily a keyboard instrument. If you want to play it like one, fine; I do too. But your keyboard technique will not be the same at all. Phrasing, articulation, touch — nothing is the same on a synthesizer keyboard, and in fact everything changes from one patch to the next. This is a *warning*.

2) In the final analysis, what you buy is not nearly as important (within limits) as what you know or can learn in a hurry. Walter Carlos has a physics degree; you don't necessarily need to go that far, but one way or another that's the road you're on when you get involved with electronic synthesis of audio. Everyone "knows" there is no substitute for experience, but people still try to find one. This is another *warning*.

3) Music is a spiritual discipline. Like Zen, like any craft well and truly practiced, it can bring enlightenment. In this respect electronic music is not different by one iota from traditional music. But it takes a lot of hard work. A synthesizer is technically a far more demanding instrument than, say, piano or organ, and far less forgiving of faults. This is *counsel*, and it's intended not to scare you but to show you how high you can go with a synthesizer, even a tiny one.

Well then, to business. We will survey briefly the range of what's available; then we'll take a look at the oldest models still on the market; then we'll look at what's newest and see how it stacks up; and finally, we'll do a little futurology.

What's available

There are now more than a dozen companies making synthesizers or synthesizer accessories and distributing them more or less on a national scale. In no particular order, they are:

Oberheim Electronics, Arp Instruments, Moog Music, Eu Systems, Buchla Associates, Electronic Music Laboratories (ElectroComp), Electronic Music Studios of London (Synthi), Aries Inc., Steiner-Parker, Polyfusion, 360 Systems, Sequential Systems, Paia, Roland, Korg, Trine, and Ozni.

Some of these are too new or too marginal (or their products are too awful) to merit serious discussion. We will confine ourselves to about a half-dozen names. And rather than discuss each make and model separately, we'll do a series of comparisons between competing models in several price ranges.

Older models

Modular Systems. In the order of their public appearance, this group consists of the Moog 900 series instruments, the Arp 2500 series, and Eu's 2000 series.

The Moog 900 series is available at present in three stock versions: the Model 15, the Model 35, and the Model 55. Some of the modules in the series are basically unchanged since 1964; others have undergone consider-

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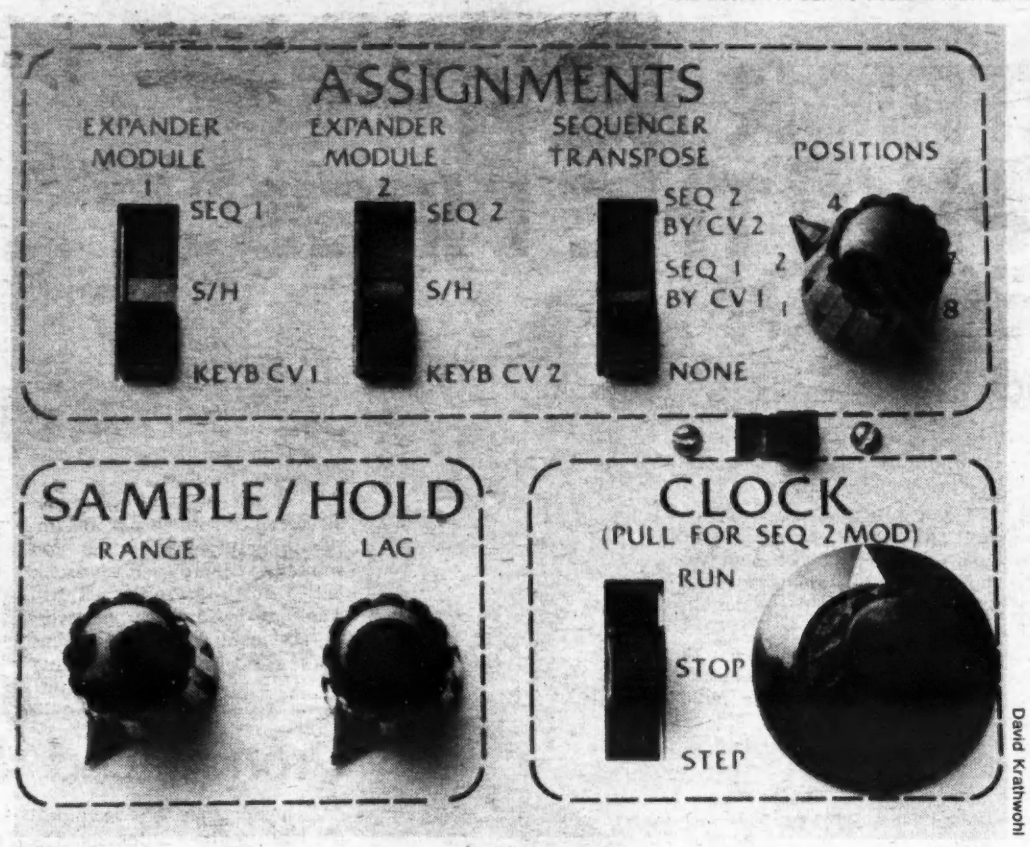

David Krathwohl

able evolution. Available module functions include VCO's both linear and exponential, a VCA, low- and high-pass VCF's, four-stage envelope generators, 4 x 1 mixers, an 8 x 3 analogue sequencer, a bank of fixed-frequency resonant filters, a frequency shifter, sample & hold, single- and dual-voltage keyboards, envelope follower/comparator, and noise generator. Additional specialized functions usually included for convenience are banks of attenuators, a coupler for the two filters, an exponential converter ("driver") for banks of two or three linear VCO's, a timing interface and analogue switch for the sequencer, and some hardwired switching capability for the most common patching needs.

All patching other than what is hardwired is accomplished by phone-plug patch cords for audio and control and Jones connectors for timing signals.

The Arp 2500 series was introduced in May 1970 and has undergone no major changes since then. There have been minor changes in the cabinetry and circuitry. Available functions include single and dual exponential VCO's, a state variable ("multimode") filter, dual and quad envelope generators, a combination low-pass VCF and VCA, a combination ring modulator and VCA, a 10 x 3 analogue sequencer, a 4 x 2 analogue switch, a dual sample & hold, noise generator, and a "voice" module — a combination of VCO, VCF, VCA, and two envelope generators. Patching is by matrix switches.

Eu Systems is a West Coast company whose modular systems began to be available around here about three years ago. The functions include all the standard VCO's, VCF's, and VCA's found in the other two systems we've described so far, plus an extraordinary range of accessory functions — reverberation, logic circuits, preamps, envelope followers. Their sequencer complement is itself modular, with a choice of 8 x 4 analogue or 256-step digital. They have the only true polyphonic keyboard among modular systems — (Moog recently installed a custom four-voice polyphonic system at UMass-Columbia Point, but it is not a standard item in the Moog catalog) and their patching system offers a unique combination of front-panel patch cord connections and rear-panel "firmwire" (*i.e.*, normaled) connections.

Evaluation. Each of the systems is in some way unique. In spite of its age, the Moog system is not at all obsolete and offers some features — such as linear FM, clamping, filter coupling, series or parallel delay for timing signals, and frequency shifting — which are not available anywhere else in modular systems. The system's greatest shortcomings are probably the absence of attenuators at most control inputs and the "gate only" keyboard logic. The former can be remedied by patching; the latter cannot, and this sets a decided limit on one's keyboard tempos for any except the simplest envelope structures. I have sometimes used an Arp keyboard with Moog modules in order to get around this shortcoming.

Time, experience and hindsight have not dealt kindly with the Arp 2500 series. When it first appeared it was a considerable innovation in several respects: the VCO's were the most stable that had appeared to date, the trigger-and-gate keyboard logic was new and was a thorough-going improvement over the Moog "S-triggers," the multimode filter was revolutionary, and the matrix-switch patching kept a neat and accessible panel (reaching through a jungle of patch-cords on a large Moog system is not easy). The most significant overall change introduced by Arp was the complete uniformity and compatibility between all signal inputs and outputs in the system. They removed all electronic distinctions between audio, control and timing signals, so that the differences became, as they should have been all along, purely functional.

On the other hand, there are some glaring inconsistencies in the system. There is no access to any VCA except by going through either a filter or a ring modulator. Although most control signals from the lower matrix panel go through attenuators, crucial keyboard control voltages from the upper matrix panel cannot be attenuated except by patching them down to the lower one. There is no 24Db/oct. highpass VCF to com-

Continued on page 22

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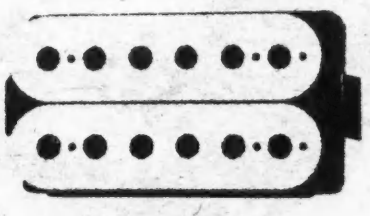

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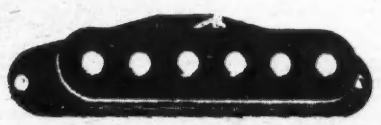

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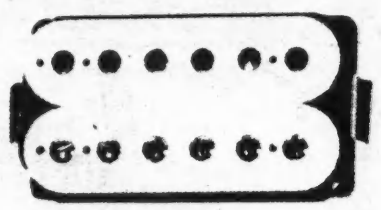

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OH, PATRICK SKY, THE PIPES, THE PIPES

Celtic revival in Rhode Island

by Martin F. Kohn

In his rambling red house in Perryville, Rhode Island ("dead across from the graveyard, if you'll pardon the pun"), Patrick Sky is discoursing on the history of Irish music.

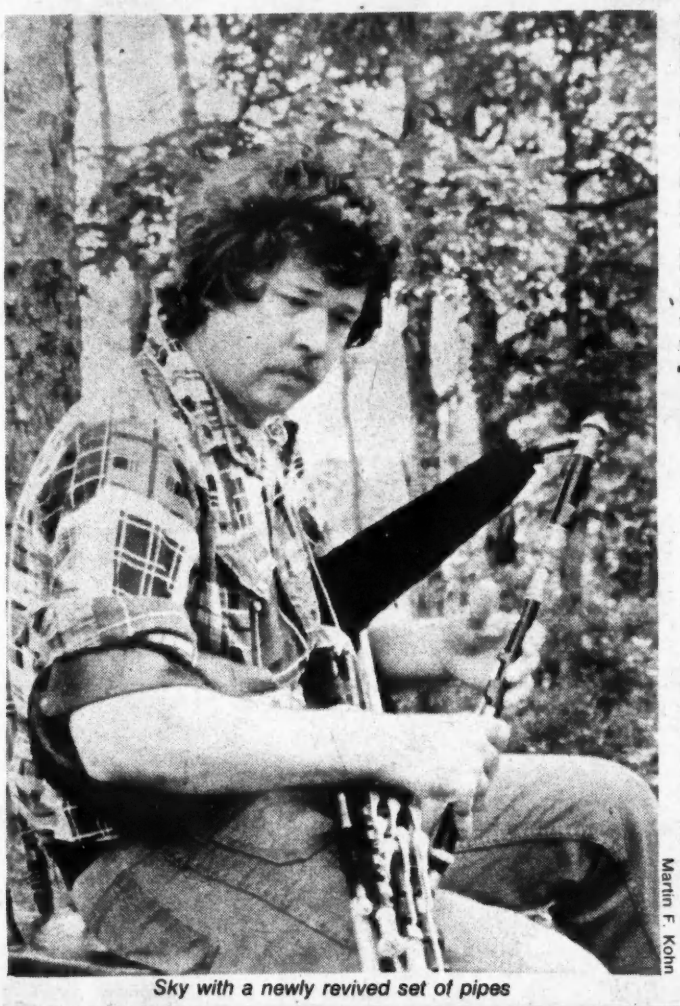
"As horrible as it is to say, the best thing you can do as far as folk music is concerned is to try to repress it. You get a society that's really happy — they don't have hardly any music at all to speak of. But you get a society that's repressed or had war or really hard times, there's just all kinds of really incredible music.

"Of course," he continues, "No one wants to suffer so they can write a song." He laughs. "That's the bind you're in, you know?"

It's a bind Patrick Sky is no longer in. In the mid-'60s Sky was one of the young folksinger/songwriters frequently mentioned in the same breath as Tom Paxton, Eric Andersen, Gordon Lightfoot and the late Phil Ochs. Today, at 37, Sky is almost singlehandedly preserving the Irish musical tradition of Uillean piping.

He has given up show business, but not music. "I'm playing music," he is quick to point out. "I'm not performing as an American folksinger; I'm not doing that."

Sky moved to Rhode Island in 1970, while still an active performer. "I was looking for any excuse to leave New York," he says. "I hated New York. I still have that pleasure." The city and its world of big-time entertainment were giving him a dose of separation blues.



Martin F. Kohn

Sky with a newly revived set of pipes

"The business end of the music got so corrupt that it was impossible to play unless you wanted to literally sell your soul, and I just couldn't hack it." Through performing, however, he got involved in his current work — making and preserving the Uillean (pronounced Illin) pipes, which he describes as "kind of the granddaddy of Irish music."

Sky first heard the instrument when he sang at the 1971 Philadelphia Folk Festival. A piper named Liam O'Flynn was also on the bill. Sky loved his sound and hired O'Flynn as the opening act for a concert tour he had lined up.

"So I naturally got interested in the pipes that way. I got into making them because there's no

Continued on page 14

Pronounced "Illin"

Although they are bagpipes, the Uillean pipes differ from the more familiar Scottish variety in several important ways.

The main difference is that the bag that forces air through the Uillean pipes is inflated by a bellows tucked under the musician's arm and pumped by his or her elbow. *Uilla*, the word from which the pipes take their name, is Gaelic for elbow. Scottish bagpipes are inflated by the player's breath.

In volume, Uillean pipes are softer than Scottish bagpipes. They are about as loud as a fiddle and are actually a chamber instrument, meant to be played and danced to indoors. Uillean pipes blend well with other instruments and have a plaintive, expressive sound.

Besides the bag and the bellows, Uillean pipes consist of the chanter (pipe for melody notes), the drones (which provide a steady D note around which the melody is played), and the valves or regulators (which add harmony to the melody).

Probably the best-known Uillean piper to American audiences is Paddy Moloney, a member of the Irish traditional group, the Chieftains, whose tour brought them to New England last spring.

Incidentally, last May turned out to be Uillean Pipes Month on network TV. Sky appeared on the *Today Show*'s salute to Rhode Island, while on *To Tell the Truth* the real Paddy Moloney stood up and played a number.

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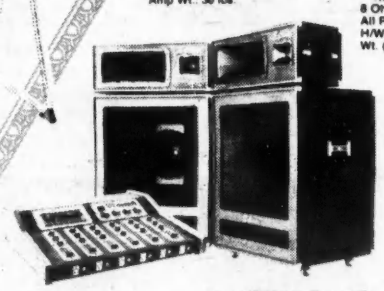
Amp Wt.: 30 lbs.

Two Cabinets; Each Contain:
1-12" SRO Speaker
77 oz. Magnet, 2½" Voice Coil
E-V 8-HD 120° Diffraction Horn
E-V 1823-M Horn Driver
Passive Crossover
1,000Hz, 12dB/Octave
8 Ohms, 2 Required
All Plywood Cabinetry
H/W/D (each): 17" x 24" x 17"
Wt. (2): 125 lbs.



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All Plywood Cabinetry

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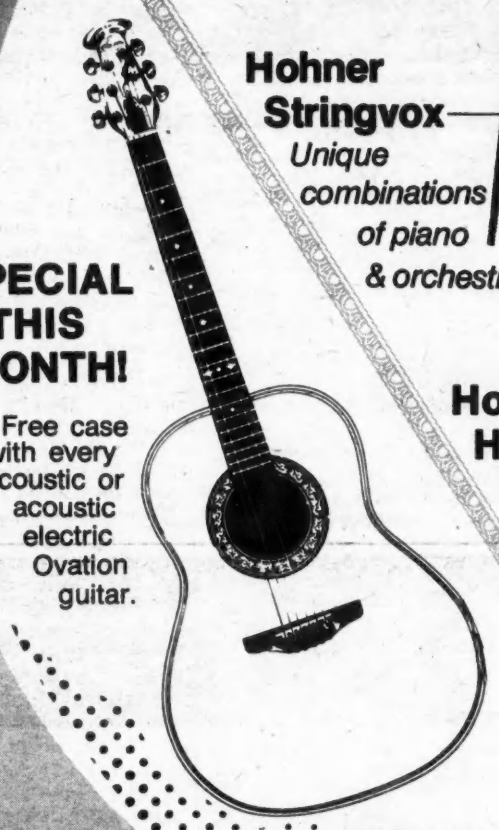

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SKY

Continued from page 12

one making them, and I realized that if I wanted to play them I was going to have to make my own reeds." From there, it was an easy decision to start building the entire instrument.

He had never made a musical instrument before (unless you count the guitar neck he grafted onto a toilet seat for a happening with Salvador Dali) — but, says Sky, "I just kind of have a knack for shop."

One of the first things he did was have his own set of pipes X-rayed at the University of Rhode Island in order to learn what makes them tick without having to dissect them.

Sky's pipemaking project receives financial support from the Rhode Island State Council on the Arts, the state Bicintennial Commission's Irish heritage committee and the John W. and Clara C. Higgins Foundation of New Canaan, Conn.

"Uillean pipes were on the verge of complete extinction," Sky explains. "It got so bad once, there were maybe three people in the world who could play them at all. There was a whole period in Irish music when no one played Irish music, even the Irish, because it was considered bogman's music, trashy music. You just couldn't play it."

Nick Pasmore

Paddy Moloney of the Chieftains

Sort of the bluegrass of the Emerald Isle? we asked.

"Oh, it was even worse than that. I know friends — in Ireland — who, when they were growing up, liked Irish traditional but they had to play it by themselves in the attic because if the children at school heard that they were playing it they'd be laughed out of school."

Then, too, when Ireland was under British rule, it was not only bad form to play Irish music. It was illegal.

Besides making pipes, Sky is looking for a publisher for a book he has written, "a tutor for the pipes." So far, publishers have reacted less than enthusiastically, but Sky is undaunted. "I think it needs to be done whether the interest is there or not. Because that's one of the reasons the pipes almost died out. You go to any library anywhere in the world and there's absolutely nothing on the pipes."

As with other exotic instruments, there is a sort of Uillean pipes underground. "Since I started this," Sky recounts, "I've uncovered a few pipers here in the United States. There's one in San Francisco. In Chicago there's a fireman who's a really good piper. They're there, but everybody got separated and I think that's one of the reasons it almost died down. So I've been making it a point to be in touch with these fellows."

He has also been in touch with pipers and pipemakers in Ireland, of whom there are not many. Sky has been to Ireland several times to record and study with traditional musicians. One result of his travels is the record *Seamus Ennis: 41 Years of Irish Piping*. To Sky, who produced Mississippi John Hurt's last recordings, the preservation of folk music is familiar territory.

Mississippi John Hurt was part of Sky's environment — the South (he was born in Georgia and spent much of his life in Louisiana). The Uillean pipes represent part of his heritage. His ethnic background includes, he admits, "only some" Irish.

Yet, his love of things Irish doesn't stop with music. He is also studying Celtic mythology and poetry as a student in Goddard College's adult degree program and has been writing poetry inspired by those studies.

"It's interesting to me to take some of the characters out of Celtic mythology and kind of superimpose them on modern . . . like, if you picked them up and put them in today, what would they do?"

In a sense, the same thing has happened to Pat Sky. A character from the folkie mythology of the '60s, he picked himself up and went his own way, following his own kind of pipe dream.

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		S/N Ratio Weighted in dB	Output @ 3% THD	S/N in dB (re: 3% THD)	THD at O dB (%)
TDK	SA	66.5	+4.2	66.0	0.9
AMPEX	20:20+	56.4	+1.9	—	—
FUJI	FX	60.0	+2.3	—	—
MAXELL	UD	—	—	58.5	1.1
MAXELL	UDXL	62.5	+2.7	—	—
NAKAMICHI	EX	60.0	+2.3	55.0	1.1
SCOTCH	CHROME	—	—	64.0	1.3
SCOTCH	CLASSIC	62.5	+2.0	—	—
SONY	FERRICHROME	64.0	+2.1	64.0	1.8

Decks used for tests: Magazine A-Pioneer CT-F9191 (cross-checked on DUAL 901, TEAC 450); Magazine B-NAKAMICHI 1000.

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NEW INSTRUMENTS PRODUCTS GUIDE

What ever happened to the trombone?

From Music Man. . .
The Reflex Horn Speaker System. A front loaded bass reflex enclosure with a "folded horn" as opposed to a conventional port. The unit operates in a manner similar to rear loaded folded horn speakers (W Box), but boasts improved treble response made possible by the overall design and the use of aluminum voice coils implemented to increase the power output in the treble register. The Reflex Horn Speakers are manufactured in two configurations — a single 15, rated at 65 watts R.M.S. and a twin 12 rated at 130 watts. The former (the 115RH-65) houses a single 15-inch speaker with a 2.5-inch voice coil. Impedance is 8 ohms. The larger unit (the 212RH-130) comes with two 12-inch speakers each with 2.5-inch voice coils. Impedance is 4 ohms. Both are recommended for use with bass guitar.

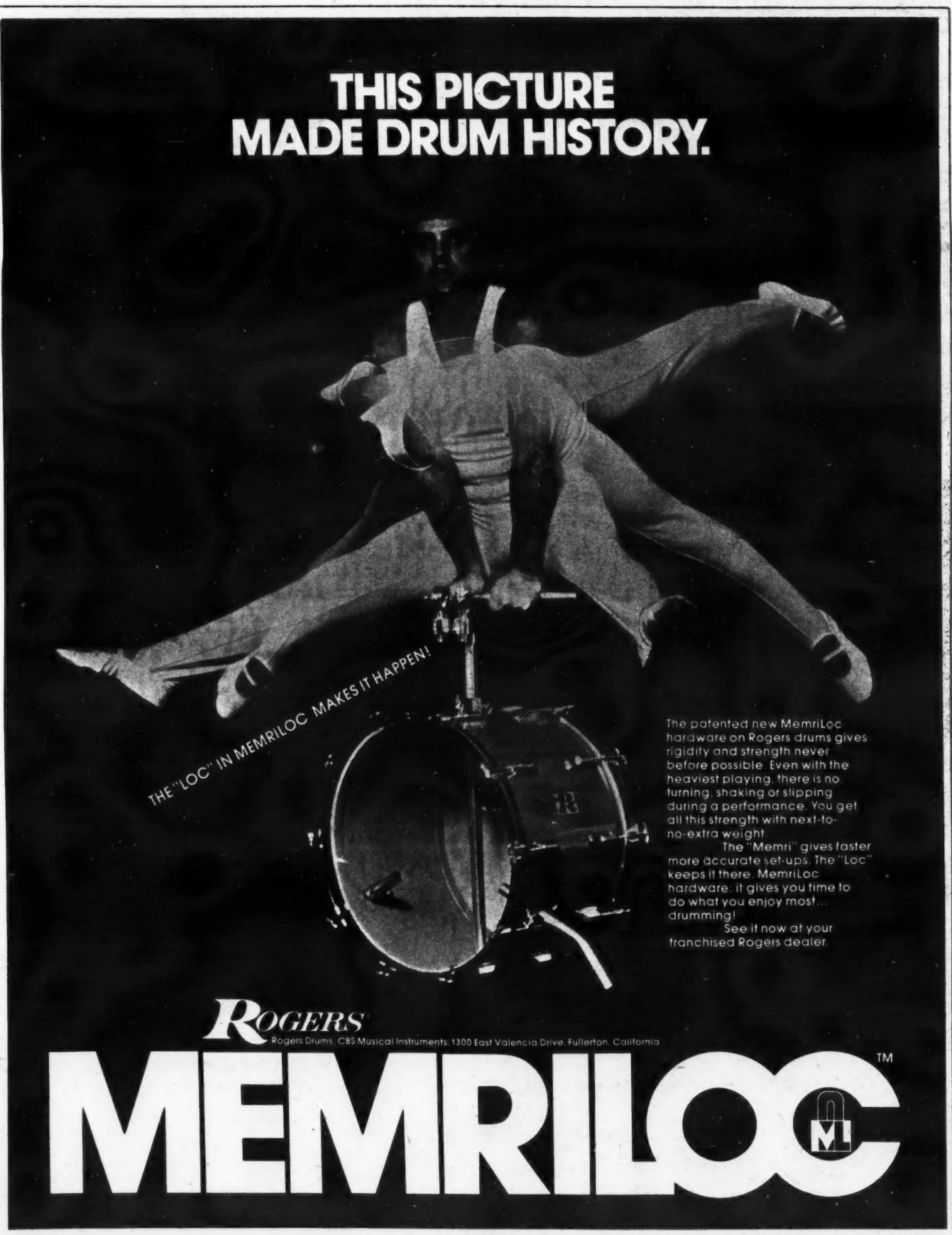
Custom three-manual Vako Polyphonic Orchestron

The Series Sixty-Five. A series of eight amplifier consoles featuring an IC pre-amplifier with computer-type operational amplifiers in the tone control circuit; a high energy super-high voltage vacuum tube power amplifier designed to deliver up to 50 percent more power than commonly used 6L6 types; a power reduction that allows the power tubes to be driven into distortion at levels when most other amps overload the input stages; a redesigned reverb circuit that provides additional drive at low and medium volume levels and an unusual phase reversing circuit that simulates the Doppler effect *a la* a rotating speaker.

The basic model of this series is the Model 65 — a two-channel amp with a set of two inputs, bright switch, volume, treble, middle and bass controls for each channel. One channel has a low-frequency turn-over point in its tone circuitry that is particularly useful for electric bass. The amp also comes with a deep switch and a master gain control that operate on both channels. The unit is equipped with two output jacks and an impedance switch which allows operation with either four or eight-ohm loads. The model 65 Reverb is similar to the Model 65 except that one channel includes both tremolo and reverb. A dual foot-switch is included for control of these functions.

The Series Sixty-Five culminates in the Model 212-65 — A two-channel amplifier with channel one featuring two inputs, bright switch, volume, treble, mid-range and bass controls. Channel two comes equipped with the same, plus reverb, tremolo intensity and tremolo speed controls. A deep switch master gain control and power reduction switch operate both channels. The amplifier can be operated with either four or eight-ohm loads, and is designed with two 12-inch speakers with 2-inch aluminum voice coils.

From Vako. . .
The Polyphonic Orchestron. A versatile keyboard instrument designed by synthesizer genius Dave Van Koevering for Patrick Moraz of Yes. The Vako people claim that the Polyphonic Orchestron is advanced beyond any previous electronic organ or synthesizer designed for live performance. The system is based on the use of modulated light recordings (laser sounds) of actual acoustic sounds in the Orchestron's memory. These encompass the sounds of pipe organs, bass instruments, stringed instruments and both male and female human voices. In addition the instrument can produce the traditional electronic organ sounds (Hammond B-3) and the like. The Orchestron boasts 30 preset synthesizer sounds, a voltage controlled solo line with touch-sensitive expression and the ability to interface its sequencer with six tracks of live performance memory. It's clearly more than your basic high-school rock band needs. It's a custom three-manual unit.
The Model C Polyphonic Orchestron. The little brother of the above-mentioned monster. It also operates on the principle of modulated light measured by photoelectric cells. A variable area sound track is cut by a high-energy laser on a thin translucent disc. As the disc is rotated, the light is modulated by the laser-cut soundtrack. The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modulated light is then converted into varying electrical impulses by the photo cells. Sounds can be sustained as long as desired and a single key, chord or entire keyboard can be sounded polyphonically. Standard unit comes with expression pedal and memory discs for violin, cello, pipe organ and flute. Optional discs include vocal choir, Hammond B-3 and French horn. Suggested base price is $2250. For $3800, Vako offers the Model Double "C," a two-manual instrument with two expression pedals and generally twice the features of the single manual Model C.

From Steiner-Parker. . .

The Synthacon. A new small synthesizer designed for easy use in either live performance or studio work. The basic design feature relies on the use of switching to achieve function interconnections. No patch cords are necessary to route signals from one area to another. This switching system makes it possible to achieve more than 35 billion (count them) different sounding set-ups without ever turning a knob or depressing a key on the keyboard.

The Synthacon produces sawtooth, triangle, square wave, pulse and sine wave waveforms, plus white and pink noise. The controls consist of 26 knobs, three trimmers and 43 switches. Oscillator ranges go from less than 1/10 Hz to greater than 20,000 Hz. Priced at $1195. Local dealers have complete specifications available.

From Oberheim. . .

The Mini-Sequencer. This is a dual-output, eight position analog sequencer with sample/hold and voltage controlled clock. Eight dual concentric pots are provided for generating two separate control voltage sequences. These two outputs can be used to drive separate synthesizer voices (or separate oscillators) to obtain two melodic lines, or one of the control voltage outputs can be used to drive the voltage controlled clock in order to generate a desired rhythm. A rotary switch is provided for setting the sequence length from one up to eight steps and each sequence position is indicated by an LED indicator. The voltage controlled clock controls both the sequence rate and the sample/hold rate. This rate is controllable over a range of from one clock every ten seconds to 40 clocks per second.

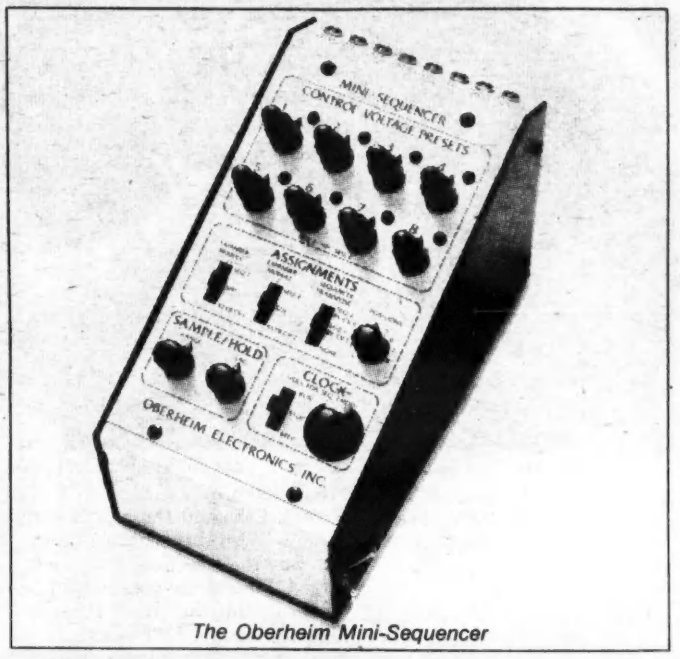
The Synthesizer Expander Module. A compact instrument that combines the most often needed circuitry of an electronic music synthesizer in one module. Two voltage controlled oscillators are configured with a four-mode voltage-controlled filter, two envelope generators, a low frequency oscillator and a voltage controller amplifier. The unit has a variety of applications — with a keyboard to form a small electronic music synthesizer; to expand the capability of existing synthesizers; with systems employing a digital sequencer to allow both the main synthesizer and the sequencer to be played simultaneously; with polyphonic keyboards to form multi-voice polyphonic synthesizer systems, and as a precision laboratory signal generation and processing device.

From MXR. . .

The Graphic Equalizer. The ideal tool for effortless modification of tonal contours. Ten bands cover the entire frequency spectrum in one-octave increments. A gliding touch of the slide control allows you to boost or diminish from the tonality of any part of the performance. The MXR Graphic Equalizer has a dynamic range of 110 dB; a frequency response of from 30 Hz to 20 KHz +/-1 dB; a control range from 12 dB boost to 12 dB cut and filter frequencies of 31 Hz, 62 Hz, 125 Hz, 250 Hz, 500 Hz, 1 KHz, 2 KHz, 4 KHz, 8 KHz and 16 KHz. Price is $139.95.

From ARP . . .

The ARP Omni. A new polyphonic keyboard instrument designed with the idea of placing the full sound of a symphony orchestra at the disposal of the performer. The instrument is capable of delivering the sounds of strings, brass, piano, clarinet and vibes in addition to a complete range of synthesizer sounds and effects.



The Oberheim Mini-Sequencer

The key to Omni's performance capabilities is its ability to produce several different sounds simultaneously — for example, violins and horns together with a separate string bass on the left side of the split keyboard.

The people at ARP have paid special attention to the reproduction of the sounds of stringed instruments through a process (invented by ARP) called "asynchronous phase modulation." This circuitry enables the Omni to make sounds right up to the limits of audibility on the high end. Low frequency output can be adjusted with a separate bass volume control.

The ARP Omni features high-quality switching components, computer-grade buttons, LED status indicators and logically formatted panel graphics for ease of performance.

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DHARMA

Continued from page 8

mally uninteresting players. It's amazing.

[Enter Joe Bouchard]

JB: You doing an interview here?

Q: *How'd you like to say a few words? Identify your bass — is that an Alembic?*

JB: Yeah, that's an Alembic bass. I bought it about four months ago, and it's well worth it.

Q: *Why? What are its capabilities?*

JB: It's got the low bass of a Gibson, the treble of a Rickenbacker and the midrange of a Fender, all rolled into one guitar, and ultimately mixable sounds. So really it's the ideal instrument. Some people put it down, but I think it's great. But then again, I've never really had a virtuoso instrument. This is just an off-the-rack Fender, a couple years old.

Q: *I reviewed your latest album, but I didn't say anything intelligent. I just echoed the praise of so many other satisfied customers.*

JB: *Agents of Fortune?* We got real good reviews . . . I thought we were gonna get killed.

Q: *Really?*

JB: Sure. But I guess they liked us — we took a lot of chances on it and they liked it.

Duana LeMay

He didn't die.

Q: *You thought people had you typed?*

JB: Yeah.

DR: I didn't think so. I thought people were gonna like this record.

JB: I thought the people were gonna like it. I thought there was no way the fans *wouldn't* like it, but I thought the press would be critical. But they liked it, so we got the best of both worlds.

Q: *You deserve it; it's about time. I've been a Cult fan almost against my better judgment for many years.*

JB: Boston's been a slow town for us until now. We've done good shows here — it's just been slower than L.A. or Indianapolis or Atlanta.

Q: *More tech facts — how'd you like to describe your laser?*

DR: Our laser system, when it's all working, is a two-laser system, with argon and krypton lasers and all the associated supportive equipment.

Q: *The argon and krypton tubes just offer different colors? There's no other difference?*

DR: No, the krypton's less powerful. The krypton laser broke. It was dropped in its case and the tube broke. We're right now awaiting delivery of a red laser. I don't think they're that powerful, the ruby lasers.

Q: *How powerful do you need? You can't get too powerful or you're going to burn out audience eyeballs.*

DR: We need about five watts. Of course with any laser, even a milliwatt laser, you're going to burn your eyes out if you look right into it. So you have to take the raw output of the laser and dilute it. The light comes out of the laser and goes into this scanning network of mirrors, vibrating mirrors. It goes into choppers and scanners, which broaden the beam and enable you to generate the planes and cones and figures — all kinds of light patterns. And of course the whole optics front end is built for us by our laser company, Laser Physics.

Lasers are a real pain in the ass. They break all the time. They're just not made for the road. We try to avoid troublesome technology, but lasers are worth it. They're by far the most dynamic visual effect there is. The great thing about a laser is that it involves everybody in the audience. Even the kid in the last row — it just reaches out and touches him.

Q: *And burns his eye out. You're doing "Don't Fear the Reaper" in the key of B?*

DR: Yeah. I wish we'd recorded it in B, because the vocal would have cut a little better. It's very hard to do live, because there's multiple overdubs — I did a lot of parts in the studio. When we tried to do it live, it was very hard. The biggest thing was that the vocal wasn't cutting. Raising the key was a good move. It probably should have been done that way on the record.

Q: *On the record I really like the subdued vocals. It's quite an effect, even if it wasn't intentional.*

DR: They would have been subdued anyway, as far as the tone goes, but I think another key would have been better.

Q: *How adept are you at changing keys? Because I heard Albert say you were going to take "Morning Final" up.*

DR: Right. That's another song where we realize the same kind of thing is happening to the vocal. It's too low to really read well. He can do it on record, but live it's harder. We haven't had a chance to work on it, but I think we will try to transpose "Morning Final" up a key and see what happens.

Q: *How adept are you at transposing?*

DR: We couldn't do it on the spot. Actually I could — my part's not that hard — but I think with Eric on the keyboard and like that, we'd have to figure it out — we couldn't do it cold.

Q: *How did you come to write "Reaper"?*

DR: "Reaper" is the first song that I wrote on my four channel Teac, which I got about a year and a half ago. I started with the guitar riff, then got the idea for the tune. Then it took me another couple months to write the words and to make a demo of it.

Q: *Did you think you had a hit?*

DR: No, that wasn't really occurring to me. I wrote the song because I thought I was going to die.

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And, the Artist is so compact it'll ride to that gig in your front seat. Even if you drive a VW.

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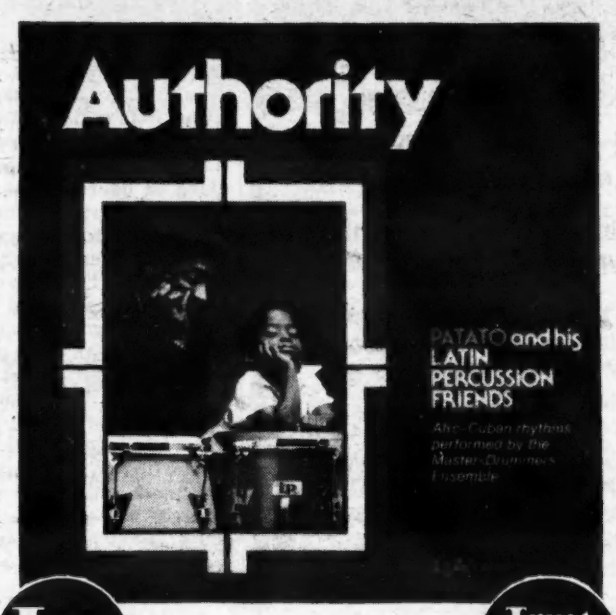

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Big Muff π This fine distortion device is high on sustain and low on distortion. It is designed for the guitarist who wants his axe to sing like a hummingbird with a sweet violin-like sustaining sound. The sustain control allows the player to optimize long sustain with a hint of harmonic distortion. Jimi Hendrix relied on the Big Muff for his smooth, mellow, supple electric-lady sound. Whole chords can be played with minimum distortion. Housed in rugged, brushed-steel chassis with a non-slip rubber matting. Comes with battery.

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BURTON

Continued from page 6

til 7:30." That would have never happened when I was a student.

Rock music has also caused a great diversity. When I first came to Berklee it was all jazz, and post-bebop jazz at that. Now diversity is the name of the game, from Indian music to electronic music to all kinds of jazz and rock and pop and everything in between. I'm sure it's better, and reflects the evolution of world society as well . . . .

I don't listen to many records at this point; I'm in my own little world of music. That includes my band, of course, and there is interaction with other people all of the time; but it's not as if I'm still looking for my own style. When you're a young player you listen to all kinds of other people in great detail for hours on end; but when your style starts to emerge, heavy doses of other players actually confuses the image you have of your own artistic identity.

I reached that point in 1966, an album called *The Time Machine*. I consider my two years with Stan Getz prior to that album, particularly my playing with Roy [Haynes] and Steve [Swallow] in the rhythm section, as my real education, because I went from being a student of the music to a player of the music. It was the perfect environment for me to get it together.

Since then it's been a growing process; having chosen the elements that make up my musical personality, they have matured and grown. My music has become more refined, subtle, varied, effective, communicative, That's been the general goal, and hopefully that's what has taken place in my playing — that it's become easier to follow, clearer to understand . . . I haven't made any changes of style, though; unlike a musician like Chick [Corea], who changes his style radically every two or three years.

My group was originally put together as a matter of practical choices and what I already knew I was comfortable with. I had worked with a guitar player, Hank Garland, for a summer in Tennessee when I first started out, so I was comfortable with the instrument, and I found that piano led to all sorts of problems. Every gig you went to, was the piano in tune with the vibes? Did it suit the piano player? And so on. Guitar was so much more practical.

When I left Stan, my best friend was Steve Marcus, the tenor player, and I probably would have picked him, but I didn't want to encourage comparisons to Stan's band. I was looking for a good foil, but I couldn't make up my mind, so I started out with a trio. I shortly ran into Larry [Coryell] and immediately knew guitar was the right choice.

It's inaccurate to put the group in a jazz-rock category now, although when we first started we were quite a radical departure from traditional jazz. Especially because Steve [Swallow] and I were already identified with Stan Getz and had done a lot of traditional recording. But the scene has become far more radical around us. We said at the time we weren't that far out: "We're still just improvising, folks; we aren't singing or dancing or anything else. We're still playing songs that start and end." But no one believed it. A lot has changed with the electronic intervention; the first fusions were more acoustic, with synthesizers in the fledgling stage. Next to something like Chick's current band, with the volume levels and everything, Larry's 1967 style would be considered mild.

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KEYBOARD

Continued from page 11

plement the lowpass VCF. The density of panel controls (which Arp was proud of at first) makes settings difficult to estimate without close scrutiny. And despite arguments to the contrary, it *is* possible to run out of patching space on the matrix panels. One of the most important constraints on the development of the system arose from the fact that the matrix switching space is relatively expensive; it is exceedingly uneconomical, both for manufacturer and customer, to devote any cabinet space to "minor" but useful functions such as floating inverter/processors, reverberation, simple two-stage envelope generators, and manually-set LFO's.

Much of this could not, perhaps, have been foreseen when the system was under development in 1969 and 1970. But it is clear that the system would have benefited greatly from an additional six months of evolution before it went on the market. In *The Last Whole Earth Catalog*, Walter Carlos complained that the 2500 looked as if it had been designed by a committee. I was working at Arp at the time, and I remember well the boos and hisses that greeted a reading of his remarks. But I think now that he was right.

Eu Systems picked up many of their opening cues from Arp: complete signal compatibility of all inputs and outputs, trigger-and-gate logic, even the particular features designed into individual functions like the multimode filter. They rejected — wisely — the matrix patching in favor of old-fashioned patch cords, but then decided — also very wisely — to provide facilities for rear-panel patching for most common needs. Thus a user gets the best of both worlds. Their face panels are roomy and unencumbered. The level of performance is superb; they are the only one of the three manufacturers to publish complete performance specs for every function in their series. They are also the most expensive of the three.

The strongest characteristic of the Eu series is its performance, its *total* flexibility, its polyphonic keyboard, and its digital functions. A shortcoming that it shares to some extent with Arp is the absence of simple performing aids such as foot-pedal voltage sources and foot-switch timing functions.

This last criticism often elicits the reply that these are supposed to be studio synthesizers, not performance synthesizers. But that is simply silly. Studio performance is still performance, and performing aids save, if anything, more time in the studio than they do onstage. Of the three manufacturers, only Moog has done much to provide performing aids, and even that venerable company has a long way to go. Most of what is necessary must be custom built; almost all of the large systems sold in the last three years have included at least some custom work.

Older and newer models

Medium-priced integrated synthesizers. Under this heading we'll talk about the Arp 2600 and the Moog 15.

The 2600, only about six months younger than the Arp 2500 system, shows how quickly a company can learn. Even now it is the single most brilliantly designed synthesizer on the market, largely because the human-engineering of the model is virtually flawless. It is a *learning* and *performing* instrument unique in its price range.

The complement of functions on the 2600 includes three VCO's, a low-pass VCF, VCA, two- and four-stage envelope generators, ring modulator, noise generator, preamp, envelope follower, two inverter/mixers, a lag processor, sample & hold, manual LFO, stereo output mixer, reverberation and monitor speakers. Considerable mixing is included in each of the main functions. Patching is either by patch cords or by a system of "normaled" signal connections to each audio and control input.

The Moog 15 was mentioned in the preceding discussion of modular systems. It will be instructive to compare it here with the 2600. The complement of modules in the 15 includes three VCO's (two of them under parallel control of a single exponential driver), a low-pass VCF, a bank of fixed-frequency resonant filters, two VCA's, two four-stage envelope generators, a noise generator/manual filters module, attenuator bank, inverter/attenuator, and 4 x 1 mixer. All of the really *necessary* things are here, but none of the extras that make the 2600 so intriguing a "research" model. No ring modulator (although you can patch one up out of the spare VCA, just as, on the 2600, the ring modulator can be used as a VCA), no preamp/envelope follower (that hurts), no reverb (that does too), no sample & hold.

On the other hand, the Moog 15 boasts a lot more filtering resources than the Arp 2600; the two envelope generators are independent of each other, and the VCO's are capable of linear FM and sync. The measured and audible performance is in most respects superior to that of the Arp 2600, *e.g.*, the smooth overload characteristics of the Moog VCA, wide-range time constants on the envelope generators, freedom from jitter (short-term frequency fluctuations), and stability of the keyboard voltage.

Evaluating. Overall, a tossup. In other words, it depends on what you're looking for. Unquestionably, the Arp 2600 is easier to perform with, easier to learn on and from (I wrote the instruction manual for it six years ago and it hasn't been revised since); but the *Moog* has an edge on measured performance and flexibility for the knowledgeable studio user.

Small synthesizers

"Performing" models. Here we'll talk about the Arp Odyssey, the Minimoog, and the two-voice Oberheim. These are completely hardwired units intended for live-performing convenience; and to be honest, before I first got acquainted with them I was inclined to feel a little snobbish and to keep my distance. In 1973, a friend and I did a six-week gig supplying live theater music with two Odysseys. That same year, with the same two units and a 2600, we did what must certainly have been the first all-Bach, all-electronic wedding service in Boston if not on the entire East Coast; the end result was my conversion to small instruments for performing live. A year later I got acquainted with the Minimoog and the conversion was complete.

Rather than recite the obvious characteristics you can learn from manufacturers' literature, I'll point out the less obvious strengths and weaknesses of these small synthesizers. What, for example, does the Arp Odyssey have that the Minimoog doesn't?

Quite a bit: sample & hold, manually-set highpass filter, "ring modulator," continuously variable (and voltage-controllable) pulse width, dual-voltage keyboard, hard-sync oscillator function, automatic triggering of envelope generators from the LFO.

Well, what does the Minimoog have that the Odyssey doesn't? A few items: octave switching, three VCO's (one more than the Odyssey), foot-switch-controlled envelope decays, triangle outputs from every VCO (a welcome relief from buzzing sawtooth and pulse waves), and an independent external audio input.

The Oberheim two-voice sells for somewhat more than either of the preceding, but includes a full 8 x 2 analogue sequencer. The voice modules resemble a stripped-down Odyssey, *i.e.*, minus the sample & hold, ring modulator, noise generator, and autotriggering. The VCF, remarkably, is a multimode, so there is little need for additional manual filtering. The sequencer module has a sample and hold and noise generator.

Evaluation. How shall we evaluate? On a sheer function-per-dollar judgment the Oberheim wins hands down, with the Odyssey second and the Minimoog a poor third.

What about performing flexibility? Here, surprisingly, the Oberheim comes in second or third, with the other two neck and neck. The problem with the Oberheim here is basically the very tight set of front panel controls — there simply is not room for all the controls of the Odyssey or the Minimoog. This is a paradoxical situation, because electronically the Oberheim functions are as modular (*i.e.*, distinct from each other) as we could want them to be. This is not the case with either the Odyssey or the Minimoog, and produces an irresistible temptation for Oberheim owners to start rummaging around inside the unit to bring out more inputs and outputs and start patching.

So far as stock units are concerned, however, the flexibility

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contest is entirely between the Odyssey and the Minimoog, and the two are more equally matched than one might think from specifications. This is mostly a matter of very careful planning in the Minimoog, to make the most of everything it has — this shows up in the on-off switches of the audio mixer, the on-off modulation switches, the layout of the pitch-bend wheel and the modulation wheel, the individual octave switching on each VCO, and so on.

These seem like minor matters until you actually spend some concentrated weeks and months working with such units. In a "performing" synthesizer nothing counts except immediacy; and, except in one crucial respect, the Minimoog has more of this intangible but unmysterious quality than the Odyssey.

(The one crucial area in which the Odyssey has a superior immediacy is in the envelope generator controls. On the Odyssey they are, of course, a set of six sliders: four for the ADSR generator and two for the AR generator. They are at the extreme right-hand side of the control panel, and they fit very nicely under the hand. Changes in attack and decay times are easily made a part of one's phrasing in this way; in fact, all four settings of the ADSR can be changed at once in less time than it takes to talk about it. Nothing like this is possible on the Minimoog. It is physically impossible to make any subtle changes in the settings of six knobs with any speed.)

These seem like picky details, I know. But the point is that in performance synthesizers, it's details that make or break a machine. The details of the Minimoog design go a long way towards wiping out the functional superiority of the Odyssey.

It is a *total* mistake, by the way, to think of either of these synthesizers as in some way "limited" to tonal, keyboard uses. They are at least as flexible in free-form improvisation and abstract "organized-sound" composition as in playing Bach or whatever.

Tiny synthesizers

Here find the Arp Axxe, the Micromoog, and some lesser lights such as the EML 500, the Roland and Mini-Korg, and even some "preset" models from Arp and Moog. We will discuss only the Axxe and Micromoog.

But not much. Everything said under the previous heading applies here with double force: *the smaller the synthesizer, the more important its human engineering and the less important its functional complement.* The Axxe has the clearer and more logical layout, the *Micromoog* has the immediacy. Both retain sufficient overall flexibility for significant non-tonal applications. With a four-channel tape recorder, one could do some very respectable abstract work using either model.

With the "preset" synthesizers — the Arp Pro Soloist, the Moog Satellite and Minimoog, and others of that genre, we come for the first time to some real limitations. These instruments are *strictly* keyboard instruments; they have no *general* sound-shaping or sound-sculpting capability at all, and are not functionally — regardless of their internal circuitry — true synthesizers at all, but descendants in a long line of historical development that goes back to the 1940s. (The Hammond "Solovox" was one of the first instruments in that history.) So we will not discuss them further.

Recent developments

Polyphonic synthesizers. "Polyphony" has been barbarously treated in the manufacturers' literature. The word has been twisted, wrung, sprung, laundered, flung down and trampled upon. Arp was claiming a "polyphonic" keyboard from the moment they sprang into existence; Moog did soon afterwards, perhaps in self-defense. EML claimed it, and Aries, and so it goes.

In any honest sense of the word "polyphony" the Arp 2600 is *not* polyphonic, the Moog 15 is *not* polyphonic, the EML 101 is *not* polyphonic, and neither is the Arp Odyssey. It is not accurate even to describe the keyboard controllers for these units as "two-voice" keyboards. "Two-voice," to any musician, must mean something like "having the capacity to play, *e.g.*, a two-part Bach Invention with recognizably independent voices, each note having its own attack and decay as an event." And not one of the so-called "two-voice" synthesizers on the market (not even, I am sorry to say, the Oberheim, although it comes closer than any of the others) can do anything of the sort.

The first truly polyphonic keyboard system to become commercially available was announced by Eu Systems about two-and-a-half years ago. The second came from Oberheim Electronics about one year ago. And just within the past half-year, Moog and Arp have announced the Polymoog and the Arp Omni, respectively.

These four models represent two very distinct lines of research and design. The Eu/Oberheim idea is to build a completely general control keyboard which, by digital scanning techniques, is capable of outputting anywhere from one to perhaps ten (eight on the Oberheim) distinct gates and control voltage. The Moog/Arp idea is to put a separate minimal synthesizer chain — signal source, VCF, and VCA — under the control of each individual key.

What are some of the practical differences? Well, for example, on the Polymoog you can lay your arm on the keyboard and you will indeed get a note from every key depressed; ditto for the Arp Omni. On a four-voice Oberheim you'll get four notes and then nothing from any of the other keys until you lift one of the first four depressed. Ditto for Eu, depending on how many voices you ordered.

On the other hand, the Eu/Oberheim system leaves you with complete capacity for determining what each of the "voices" will sound like; for tuning of each voice relative to the others; and so on. The Moog and Arp designs, although they do allow for some split-keyboard work, are basically far more restricted in overall sonic range. They are really very sophisticated compromises between electronic-organ design and synthesizer design. Like electronic organs, their primary signal source is a chain of frequency dividers; their sonic resources are heavily biased towards preset voices, and imitative ones at that (*i.e.*, "strings," "brass," etc.).

The Eu/Oberheim system has its shortcomings. A full complement of functions to provide ten voices to go with the Eu keyboard's maximum of ten gate/voltage pairs would be staggeringly expensive — somewhere in the neighborhood of $25,000, including the keyboard. Even four voices of Oberheim synthesizer run to $4000; the maximum of eight voices runs about $7000 (the Polymoog is a little more than a four-voice Oberheim). There is a practical difficulty with the Oberheim in getting all the voice modules to sound alike, and then changing them all simultaneously when you need to (naturally, 90 percent of the usefulness of the system is in having all the modules sound alike; in fast tempos it is virtually impossible to be certain which module will get which note). Just within the last month, Oberheim has announced a digital programer and memory module for his synthesizers which should remove these difficulties. The first units should be available before the end of the year.

Evaluation. This will in part be a personal thing. My heart lies entirely with the Oberheim/Eu design. But both basic concepts are truly polyphonic and honestly so. On their own merits, the Polymoog and the Arp Omni are extraordinarily flexible musical instruments for experienced musicians. The Polymoog makes most preceding keyboard instruments obsolete, in the sense that it is no longer necessary to own both an electric piano and an organ and a tiny synthesizer in order to get all the sounds you need. It'll do them all.

Into the future

The future? As prices on microprocessors keep tumbling, we'll see "smart" sequencers that can store a keyboard lick and deliver it back inside out, transposed, squished, taken apart and reassembled any way you want to hear it. The first dim rumblings of this sort of stuff are surfacing already. By the same token, we'll have storage and retrieval of favorite patches automatically. Finally, there will be wholly digital synthesizers, but not before we've had an intermediate generation in which all control functions and audio signal generation are done digitally, while filtering and amplification are left to analogue circuits.

All this before 1980. After that, the sky's the limit.

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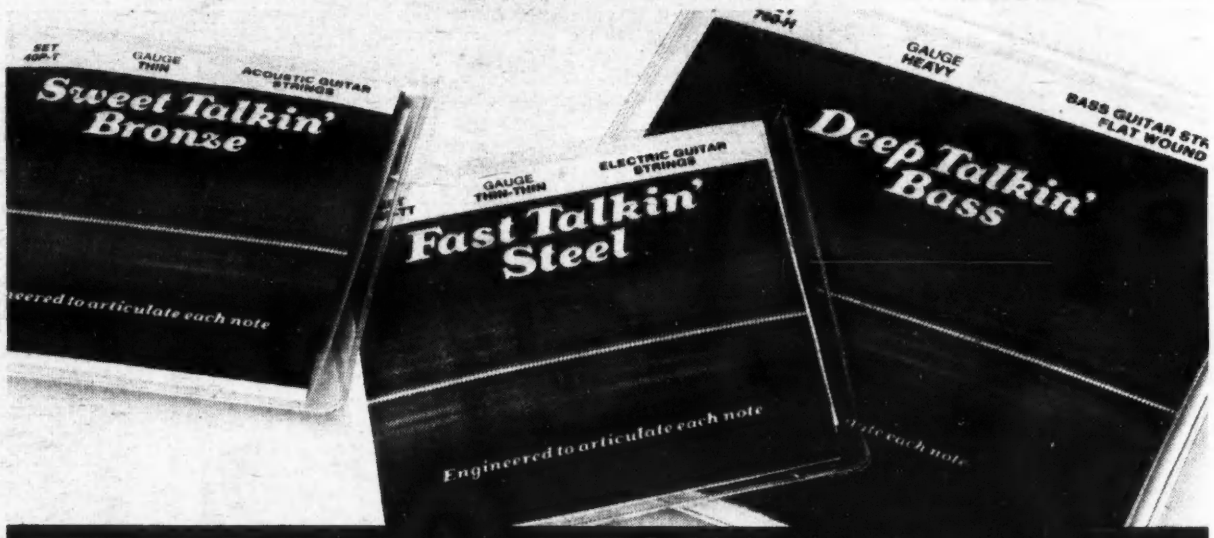

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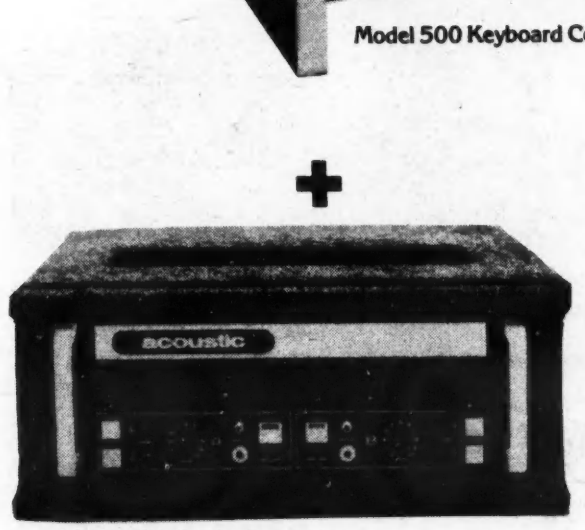

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